



Friends of Corte Madera Creek Watershed

Post Office Box 415 Larkspur, California 94977

May 15, 2000

CALFED Bay - Delta Program Office
1416 Ninth Street
Suite 1155
Sacramento CA 95814

Dear CALFED Bay - Delta Program:

On behalf of the Friends of Corte Madera Creek Watershed and A. A. Rich and Associates, I am submitting ten copies of our proposal for a steelhead trout planning effort as part of the 2001 Ecosystem Restoration Projects and Programs CALFED Bay - Delta Program.

Receipt of this grant would allow **us** to continue our efforts to improve steelhead habitat in the watershed and would make major contributions to the understanding **of** thermal requirements of young steelhead trout in the region.

Please **call** me at (415)456-5052 if **you** have questions about the enclosed proposal. Thank you for the opportunity to submit this proposal.

Sincerely,

Ms. Sandra Guldman
Co-chairperson, Friends of Corte Madera Creek Watershed

Proposal # 2001-I-203 (Office Use Only)

PSP Cover Sheet (Attach to the front of each proposal)

Proposal Title: Ecosystem Restoration - The Relationship Between Water Temperature and Steelhead Trout Growth and Productivity in the Corte Madera Creek Watershed Marin County, California
Applicant Name: Friends of Corte Madera Creek Watershed
Contact Name: Sandra Goldman
Mailing Address: P.O. Box 477, Larkspur, CA 94977
Telephone: (415) 456-5052
Fax: 415) 456-4992
Email: toyon@hooked.net

Amount of funding requested: **\$94,400**
Some entities charge different costs dependent on the source of the funds. If it is different for state or federal funds list below.

State cost _____ Federal cost _____

Cost share partners? X Yes No

- Indicate the Topic for which you are applying (check only one box).
- Natural Flow Regimes
 - Nonnative Invasive Species
 - Channel Dynamics/ Sediment Transport
 - Flood Management
 - Shallow Water Tidal/ Marsh Habitat
 - Contaminants
 - Beyond the Riparian Corridor
 - Local Watershed Stewardship
 - Environmental Education
 - Special Status Species Surveys and Studies
 - Fishery Monitoring, Assessment and Research
 - Fish Screens

What county or counties is the project located in? Marin

What CALFED ecozone is the project located in? See attached list and indicate number. Be as specific as possible: 2.5

- Indicate the type of applicant (check only one box):
- State agency
 - Public/Non-profit joint venture
 - Local government/district
 - University
 - Other: _____
 - Federal agency
 - Non-profit
 - Tribes
 - Private party

- Indicate the primary species which the proposal addresses (check all that apply):
- San Joaquin and East-side Delta tributaries
 - Winter-run chinook salmon
 - Late-fall run chinook salmon
 - Delta smelt
 - Spring-run chinook salmon
 - Fall-run chinook salmon
 - Longfin smelt

- | | |
|--|---|
| <input type="checkbox"/> Splittail | <input checked="" type="checkbox"/> Steelhead trout |
| <input type="checkbox"/> Green sturgeon | <input type="checkbox"/> Striped bass |
| <input type="checkbox"/> White Sturgeon | <input type="checkbox"/> All chinook species |
| <input type="checkbox"/> Waterfowl and Shorebirds | <input type="checkbox"/> All anadromous salmonids |
| <input type="checkbox"/> Migratory birds | <input type="checkbox"/> American shad |
| <input type="checkbox"/> Other listed TIE species: _____ | |

Indicate the type of project (check only one box):

- | | |
|---|---|
| <input checked="" type="checkbox"/> Research/Monitoring | <input type="checkbox"/> Watershed Planning |
| <input type="checkbox"/> Pilot/Demo Project | <input type="checkbox"/> Education |
| <input type="checkbox"/> Full-scale Implementation | |

Is this a next-phase of an ongoing project? Yes X No
 Have you received funding from CALFED before? Yes No X

If yes, list project title and CALFED number Local watershed stewardship: steelhead trout plan for the Corte Madera Creek Watershed, Marin County, California CALFED NO. 98-E07

Have you received funding from CVPIA before? Yes No X

If yes, list CVPIA program providing funding, project title and CVPIA number (if applicable):

By signing below, the applicant declares the following:

- The truthfulness of all representations in their proposal;
- The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Sandra Guldman, Co-chair Friends

Printed name of applicant

Sandra Guldman

Signature of applicant

I. Executive Summary

Title: Ecosystem Restoration-The Relationship Between Water Temperature and Juvenile Steelhead Growth and Productivity in the Corte Madera Creek Watershed, Marin County, California

Amount Requested: \$94,400

Applicant: Friends of Corte Madera Creek Watershed (*Friends*)

P.O. Box 415

Larkspur, CA 94977

Co-Chairs: Sandra Guldman Carole d'Alessio

Telephone: 415-456-5052 415-454-8608

Fax: 415-456-4992 415 454-1749

Email: toyon@hooked.net d'Alessio@microweb.com

The proposed study is part of an ongoing effort by *Friends* to enhance the steelhead trout population in the Corte Madera Creek Watershed. In 1999, *Friends*, in collaboration with *A. A. Rich and Associates (AAR)*, received CALFED funding to undertake a fishery resources investigation and to design a Steelhead Trout Restoration Plan (Plan), as part of a comprehensive watershed plan to improve conditions in the watershed. One of the conclusions made in the Plan was that water temperatures were potentially limiting to steelhead trout production in the watershed. The proposed study will address critical information needs, regarding the relationship between water temperatures and growth and productivity of steelhead trout in the Corte Madera Creek Watershed: From the results of the proposed study, it will be possible to identify practical site-specific restoration measures which will improve conditions for young steelhead trout in the Corte Madera Creek Watershed. In addition, it may be possible to apply the thermal requirements identified for young steelhead in this watershed to other Bay-Delta watersheds, if conditions are similar.

The proposed project addresses three of the CALFED Ecosystem Restoration Program (ERP) Strategic Goals (At-Risk Species, Ecosystem Processes and Biotic Communities, and, Habitats) and addresses one of the most important limiting factors identified in the CVPIA list of priorities: water temperature requirements and impacts on steelhead trout in the Bay-Delta.

To test the hypothesis that water temperatures are stressful to young steelhead trout in the Corte Madera Creek Watershed, a thermal bioenergetics study will be undertaken. The study will determine the relationship between water temperatures and growth and productivity of young steelhead trout in the creeks of the watershed. Tasks to be undertaken and the schedule for each task for this project include: (1) Task 1: Water Temperature Monitoring (3/1-9/20/01); (2) Task 2: Fish Sampling/Fish Stomach Sampling (4/1-9/30/01); (3) Task 3: Data reduction/Entry (10/1-11/30/01); (4) Task 4: Analysis/Report (11/1-12/31/01); (5) Task 5: Meetings (2/01,3/02); and, (6) Task 6: Project Management (throughout project).

The results of the proposed project can then be used: (1) to identify cause-and-effect type restoration actions within the watershed; (2) to identify what types of habitat provide the best thermal conditions; (3) to determine whether there is a difference in thermal requirements between the anadromous steelhead and the resident rainbow trout; and, (4) as a general template for further field-oriented thermal bioenergetics research on this and other watersheds within the Bay-Delta System. In addition, two secondary benefits will result from the proposed study: augmentation of the existing water temperature and fish population databases for the watershed.

II. Project Description

a. Statement of the Problem

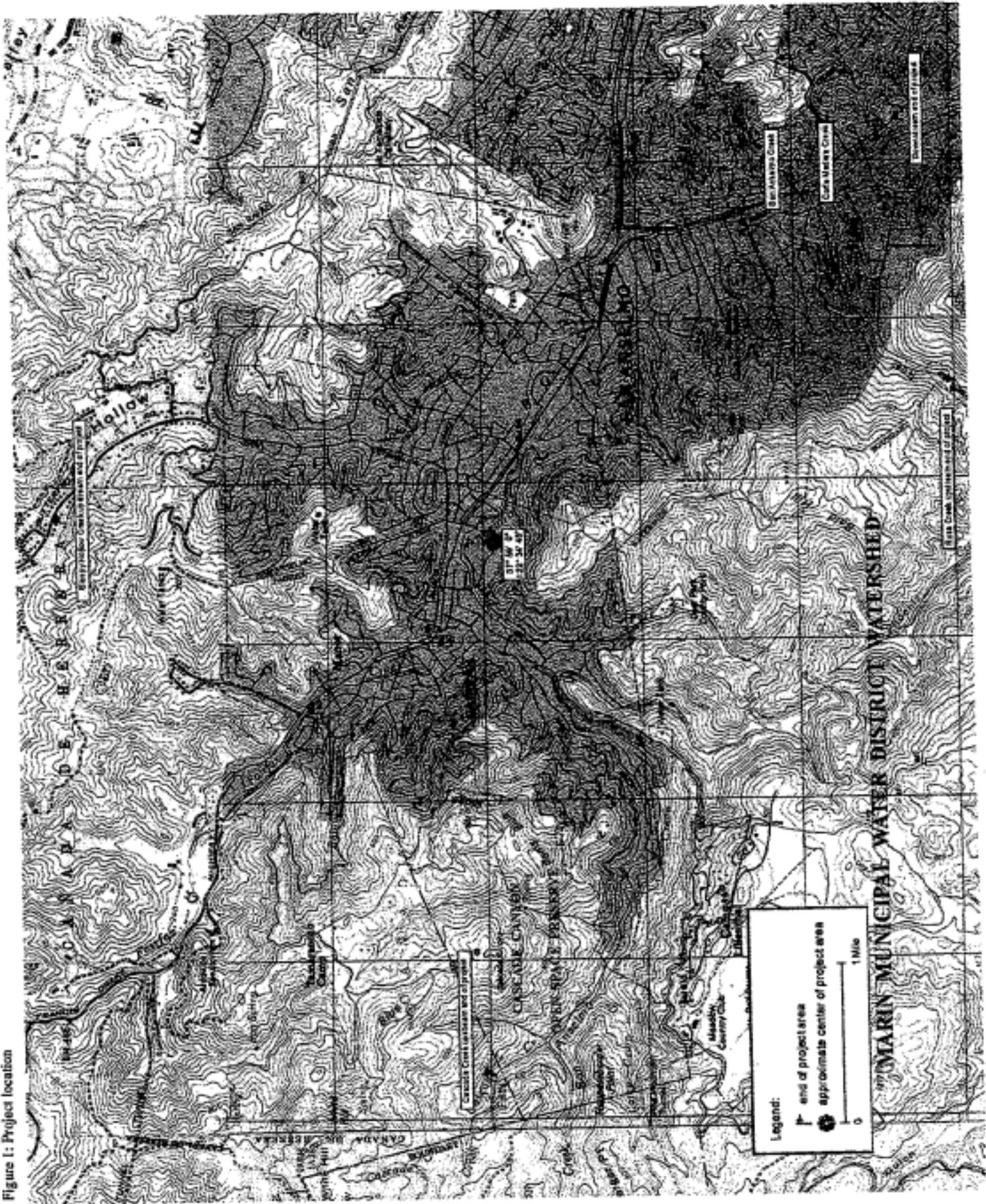
1. Problem

The proposed study is part of an ongoing restoration effort by *Friends* to improve conditions in the Corte Madera Creek Watershed (Figure 1). The watershed is situated within the Central Coast Evolutionary Significant Unit (ESU). The National Marine Fisheries Service listed the steelhead trout within this ESU as threatened, under the Endangered Species Act (Federal Register, 1997, 1998). The listing of all wild California steelhead stocks has led to increased interest in improving conditions for steelhead in the creeks and rivers of California (McEwan and Jackson, 1996). In 1999, *Friends*, in collaboration with A. A. Rich and Associates (AAR), received CALFED funding to undertake a fishery resources investigation and to design a Steelhead Trout Restoration Plan (Plan), as part of a comprehensive watershed plan to improve conditions in the watershed. One of the conclusions made in the Plan was that water temperatures were potentially limiting to steelhead trout production in the watershed (Figure 2) (Rich, 2000a). The proposed study will address critical information needs, regarding the relationship between water temperatures and growth and productivity of steelhead trout in the Corte Madera Creek Watershed. From the results of the proposed study, it will be possible to identify practical site-specific restoration actions which will improve conditions for young steelhead trout, and hence for the Corte Madera Creek Watershed as a whole. In addition, it may be possible to transfer the information on water temperature requirements for young steelhead in this watershed to steelhead in other Bay-Delta watersheds, if conditions are similar (Figure 3).

Knowledge of optimal, stressful, and lethal water temperatures on young steelhead trout is far from adequate to define safe thermal limits for this species in the Corte Madera Creek Watershed or anywhere else in the Bay Delta. Based on a comparison with previously published reports, most of which were laboratory studies, the results of the 1999 studies in the watershed suggested that water temperatures were potentially harmful to young steelhead trout in Corte Madera Creek, portions of San Anselmo Creek, Cascade Creek in July and August, and the lowest reaches of Sleepy Hollow Creek (Rich, 2000a) (see Appendix). However, although, it is known that steelhead fry and steelhead proceeding through the part-smolt transformation are more sensitive to high water temperatures than rearing juveniles, wide ranges of water temperatures have been identified as optimal, stressful, and lethal for each of these life stages (Figures 4-5). Both the difference and overlap in ranges of what is considered to be optimal, stressful, or lethal depends on the type of study undertaken and the biologists interpreting the data. As a result, water temperature requirements for steelhead in the wild are often subject to debate, due primarily to: (1) the lack of field-oriented thermal studies; and, (2) misapplication and misinterpretation of thermal methodologies (Rich, 2000a, 1997, 1987a,b).

Most thermal studies on steelhead trout are restricted to laboratory experiments on fish fed maximal rations under controlled environmental conditions. Often, it is assumed that the results of a laboratory experiment can be transferred directly to conditions in the wild. This is not a practical or safe approach, from the standpoint of steelhead trout health and survival. As steelhead do not respond in the natural environment the same way they do in a laboratory (Wurtsbaugh and Davis, 1977; Brett and Groves, 1979), it is erroneous to conclude that one can transfer the results of laboratory experiments directly to a creek or river. If one errs on the side of conservatism and chooses a very low temperature as being optimal

Figure 1: Project location



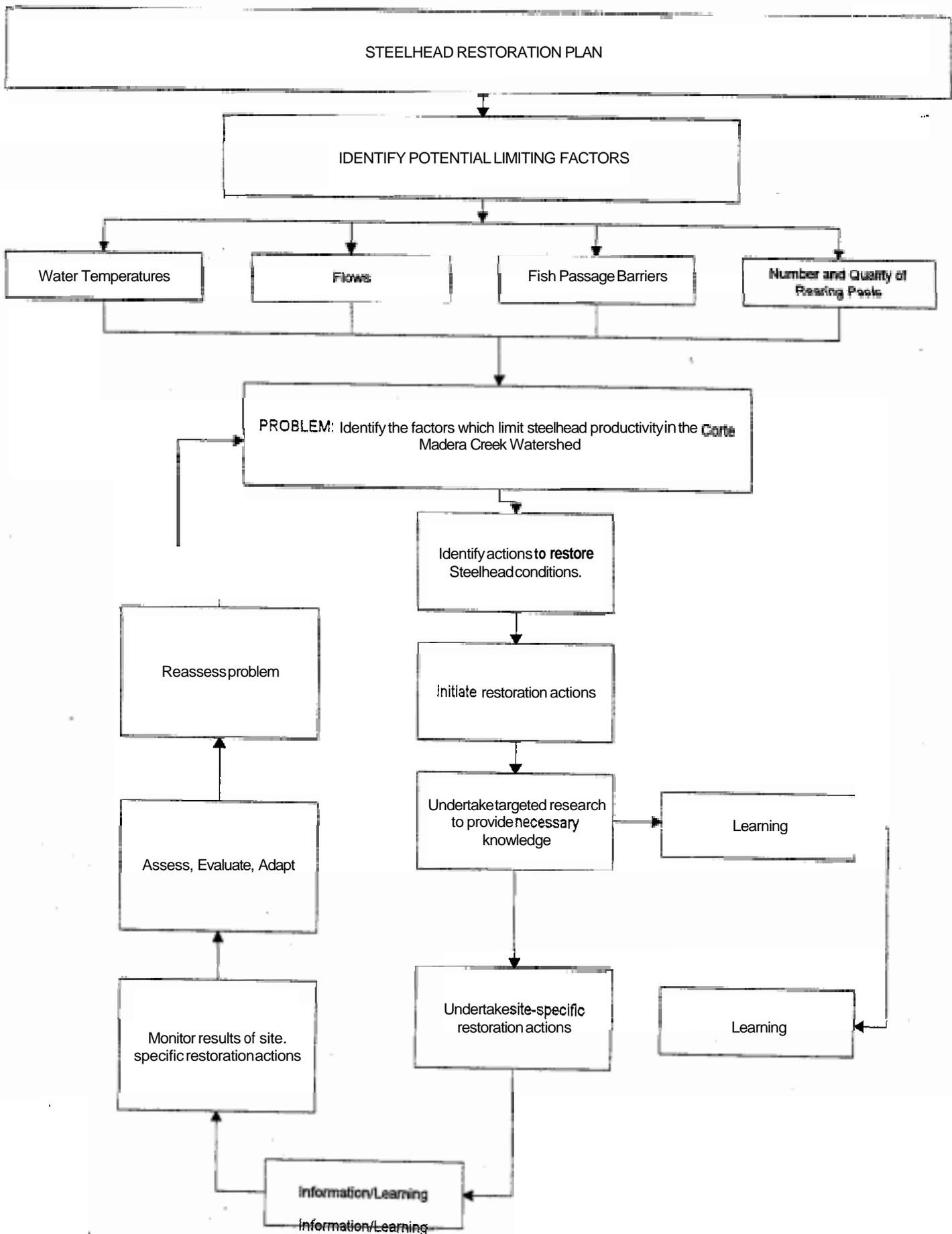


FIGURE 2. CONCEPTUAL PLAN TO RESTORE CONDITIONS IN THE CORTE MADERA CREEK WATERSHED

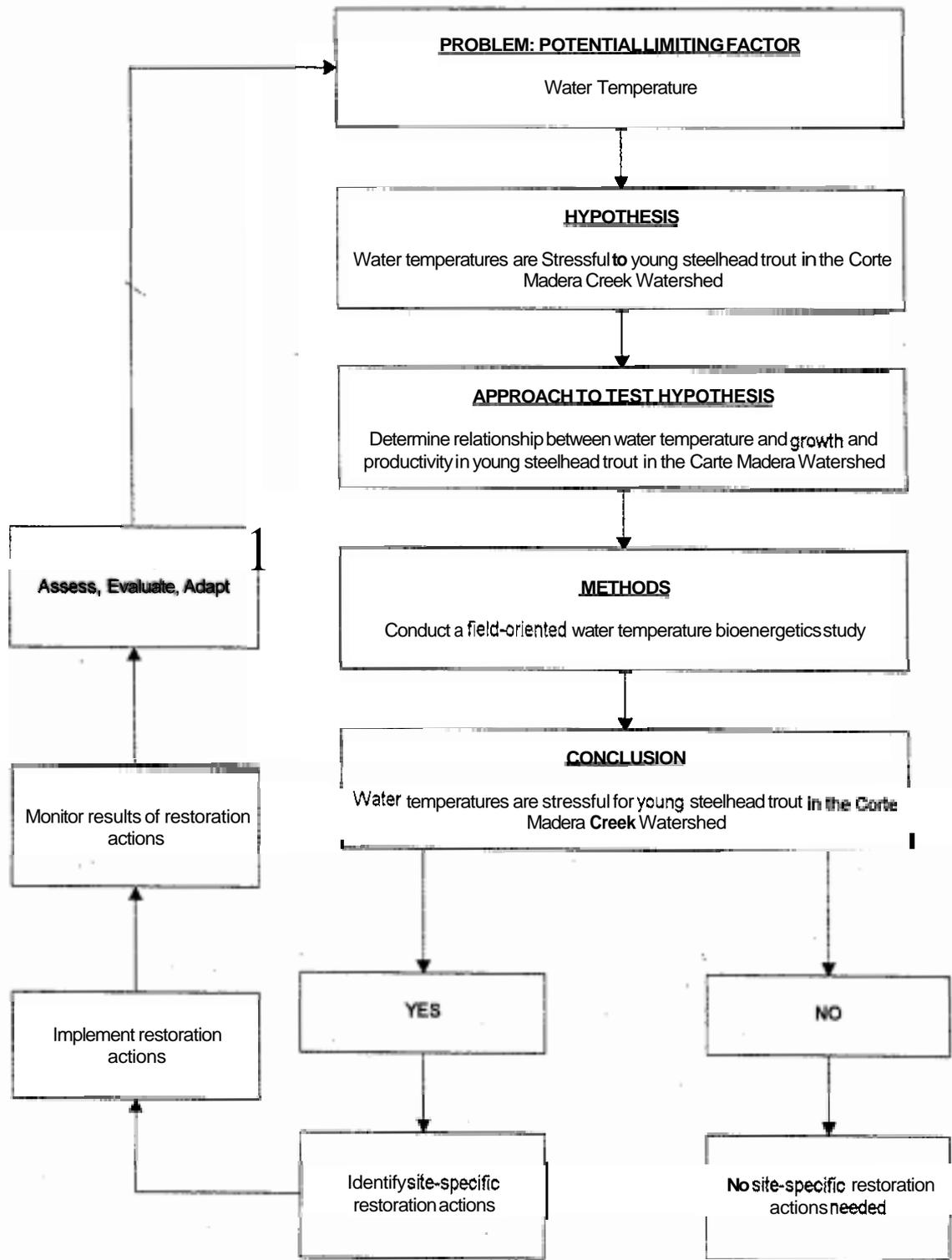
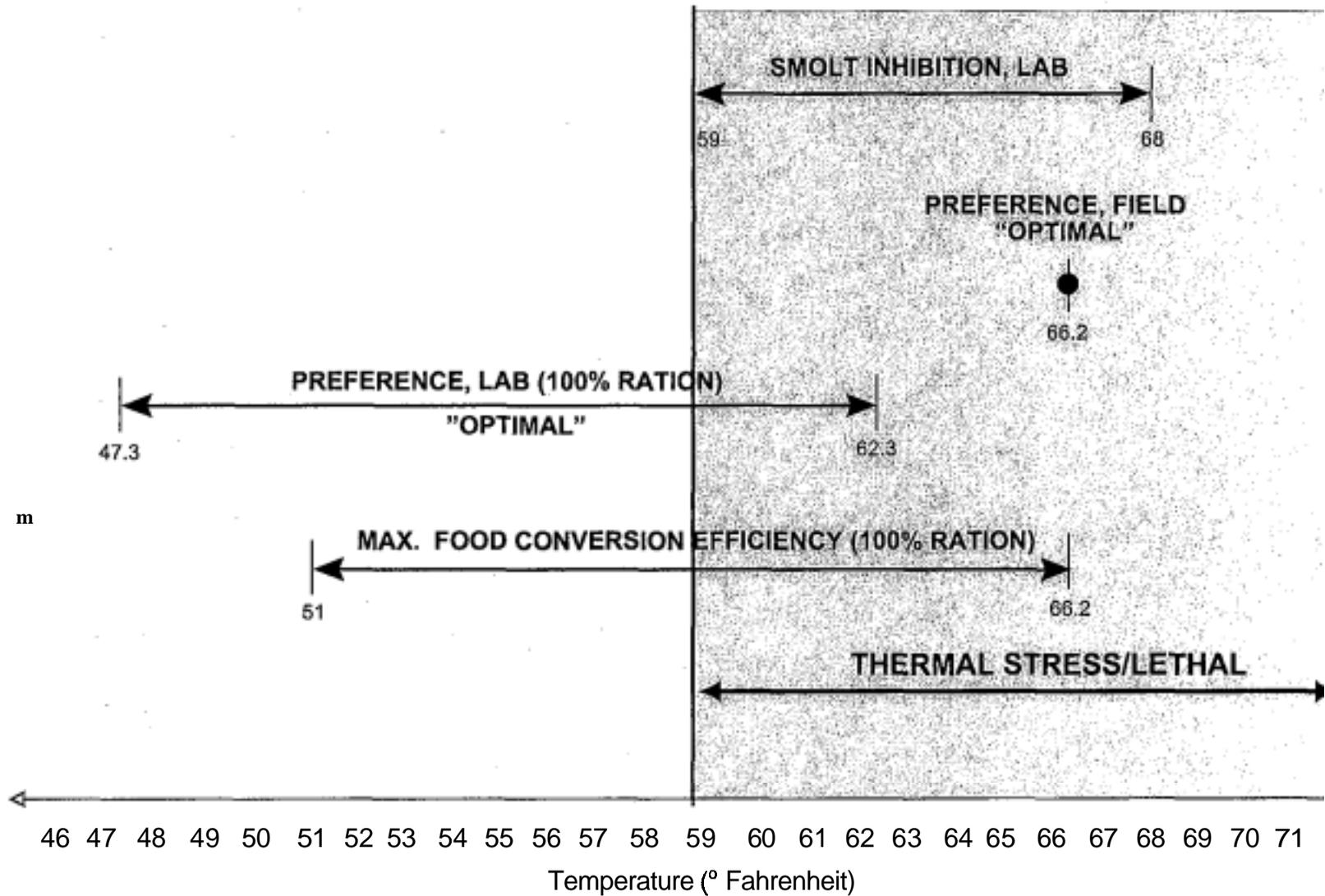


FIGURE 3. CONCEPTUAL PLAN FOR THE PROPOSED PROJECT

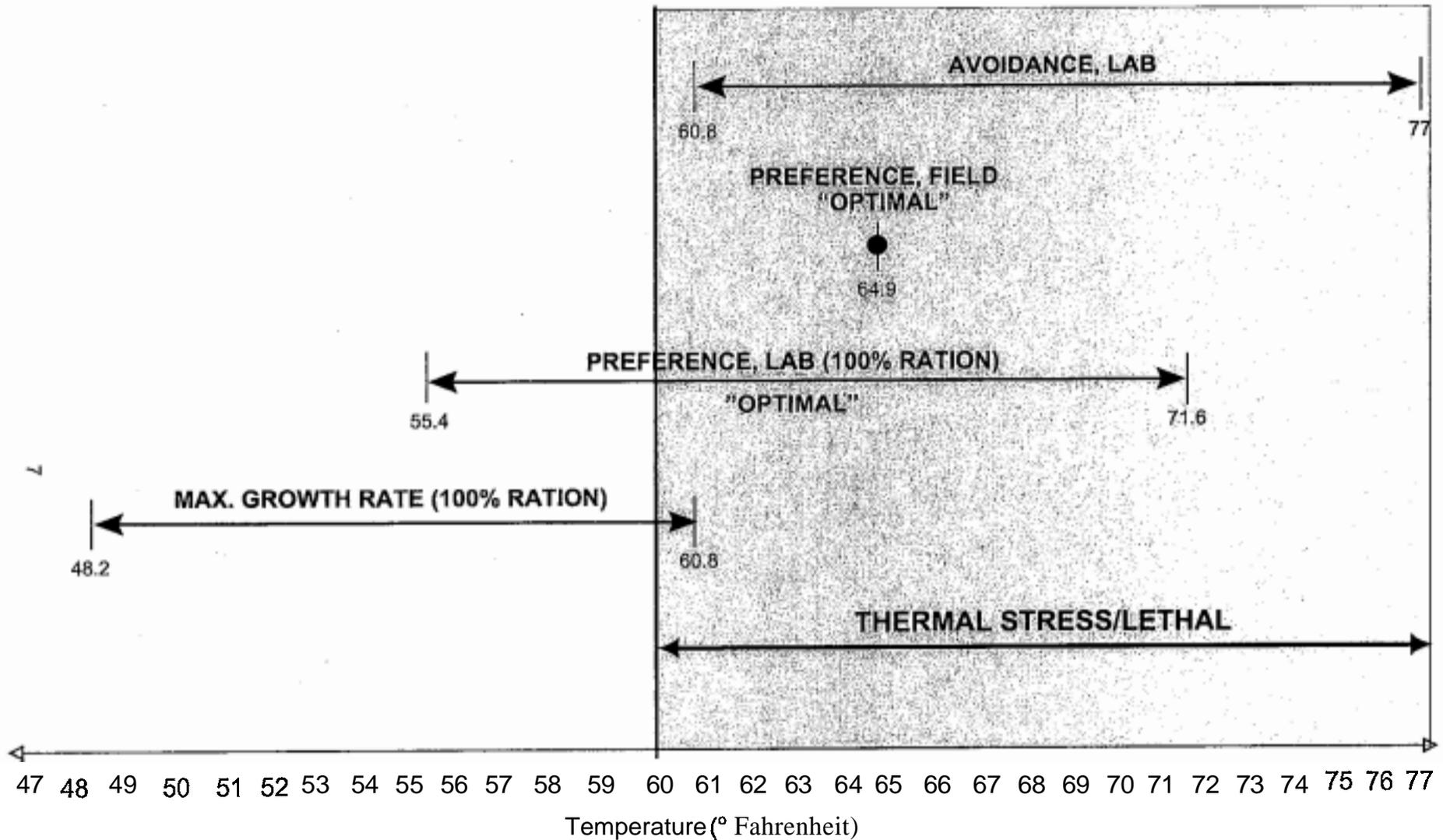
YOUNG STEELHEAD TROUT



Source: Wurtsbaugh, 1973; Adams et al., 1973; Zaugg et al., 1972; Cech and Myrick, 1999; Zaugg and Wagner, 1973.

FIGURE 4. SUMMARY OF THE RESULTS OF THE PHYSIOLOGICAL AND BEHAVIORAL RESPONSES OF STEELHEAD TROUT TO WATER TEMPERATURE.

YOUNG RAINBOW TROUT



Source: Wurtsbaugh and Davis, 1977; Hokanson et al., 1977; Peterson et al., 1979; Coutant, 1977; Garside and Tail, 1958; Dockray et al., 1998; Matthews and Berg, 1997; Craigle, 1973; Kaya, 1978; Cherry et al., 1977, 1975; Lee and Rinna, 1980; Strange et al., 1993; Spigarelli and Thommes, 1979; Threader and Houston, 1983; Currie et al., 1998.

FIGURE 5. SUMMARY OF THE RESULTS OF THE PHYSIOLOGICAL AND BEHAVIORAL RESPONSES OF RAINBOW TROUT TO WATER TEMPERATURE.

(based on a laboratory study), and undertakes restoration actions to reduce water temperatures, such actions may stunt growth and reduce productivity in the field. By contrast, if one chooses higher water temperatures, again based on the results of laboratory studies where the fish are fed all they can eat, but there is a limited amount of food in the creek or river, then the trout would be stressed, thereby reducing growth and productivity and, if extreme enough, this would lead to mortality.

A second problem with determining the water temperature requirements of steelhead trout is one of misapplication and potential misinterpretation of thermal methodologies. For example, it is often assumed that the temperature at which maximum growth rate occurs in the laboratory with juvenile steelhead fed maximal rations is also the optimum temperature, whether it be in the laboratory or in the field (Rich, 1997, 2000b). Such a conclusion could not be further from the truth. If a steelhead in a laboratory, fed all it can eat, is exposed to increasingly high water temperatures, its metabolism increases and hence, so too does its need for food. As the temperature increases, though, the energy it takes to convert the food into fish flesh increases. Thus, in a laboratory situation, although growth may increase at higher temperatures, the amount of food needed to convert the food to growth also increases (Brett and Groves, 1979). Hence, at higher temperatures, it is very inefficient for the fish to eat. Thus, the primary way physiologists determine optimum water temperatures is to determine the temperature at which maximum food conversion efficiency occurs. These temperatures are rarely equal to the maximum growth rate. In the wild, determining optimal water temperatures is extremely difficult, because the fish is constantly responding to an ever-changing environment. Without site-specific thermal bioenergetics studies which are able to integrate thermal data, growth rates, and physiological metabolic data for the fish in question, it is very difficult, if not impossible, to determine optimal water temperatures for fishes in the wild.

To adequately evaluate water temperature criteria, one must know the thermal requirements for each life stage of steelhead trout. Of all of the life stage requirements, water temperature is one of the most important, yet commonly the least understood. Temperature can be considered in two ways: as a factor affecting the rate of development, metabolism, and growth, or, as a stressful or lethal factor. The two, of course, are inseparable. The criteria for setting safe limits of temperature for fish have been considered by various authors (e.g., Coutant, 1977; Alabaster and Lloyd, 1980; Elliott, 1981). One principle governing the criteria involves setting acceptable limits to the reduction of such vital functions as growth, food conversion efficiency, swimming speed, metabolic scope, and reproductive capacity. To do this, a variety of thermal studies have been conducted, including growth and food conversion efficiency and other bioenergetics studies. The focus of the proposed study will be to collect field data during the steelhead trout parr-smolt transformation and rearing life stages to determine the relationship between water temperatures and steelhead trout growth and productivity in different areas of the Corte Madera Creek Watershed. By using data collected in the field (i.e., water temperatures, food eaten by the trout, length and weight data, and scales for age determination), together with a physiological bioenergetics model (Hanson et al., 1997; Hewett and Johnson, 1992), it will be possible to determine the relationship between daily water temperatures and growth rates and productivity of young steelhead trout in the different creeks within the Corte Madera Creek Watershed. If water temperature is a limiting factor, such an approach will result in the ability to identify thermal limiting reaches or creeks. From the results, site-specific restoration actions can be planned to improve conditions for the steelhead trout in the Corte Madera Creek Watershed.

In addition to developing site-specific relationships between water temperatures and juvenile steelhead thermal requirements, two secondary benefits will result from the proposed study: (1) continuation of the

collection of water temperature data; and, (2) continuation of the collection of fish population data for the watershed. There is considerable variability from year to year in both water temperatures fish population conditions in watershed. Hence, these additional data will be of use in increasing our knowledge of the' conditions in the watershed.

2. Conceptual Model

One of the goals of *Friends'* comprehensive Corte Madera Creek Watershed Plan is to improve conditions for steelhead trout in the watershed. A number of potential limiting factors were identified as a result of the 1999 project (Rich, 2000a), including water temperature, flows, fish passage barriers, and number and quality of rearing pools. Although eventually *Friends* would like to address all of these potential limiting factors (Figure 2), the results of the 1999 studies indicated that high water temperature was a key problem for young steelhead in some of the creeks. Using the Adaptive Management Process (Figure 3), the results of the proposed project will: (1) begin to provide the basis for identifying cause-and-effect type restoration actions in the creeks of the Corte Madera Creek Watershed; (2) provide much-needed data on the responses of wild steelhead trout to ambient water temperatures in a small Bay-Delta watershed; and, (3) it will serve as a general template for similar field-oriented thermal bioenergetics projects for other Bay-Delta systems.

3. Hypotheses Being Tested - The proposed study will test the following hypothesis:

Hypothesis: Water temperatures are stressful to young steelhead trout in the Corte Madera Creek Watershed.

Although water temperature can be a limiting factor to steelhead in the Bay-Delta system, little is known about the relationship between food availability and water temperatures. Without such information, it is not possible to determine water temperature requirements of steelhead trout in the watersheds of the Bay-Delta system. The proposed project addresses three of five CALFED Ecosystem Restoration Program (ERP) Strategic Goals and addresses one of the most important limiting factors identified in the CVPIA list of priorities: water temperature requirements and impacts on steelhead trout in the Bay-Delta.

4. Adaptive Management

CALFED's Comprehensive Monitoring, Assessment, and Research Program (CMARP, 1998) states "Appropriate and timely assessment of monitoring and research data is critical to effective management." Knowledge of optimal, stressful, and lethal water temperatures on young steelhead trout is far from adequate to define safe thermal limits for this species in the Corte Madera Creek Watershed or anywhere else in the Bay Delta (Figures 4 and 5). The proposed project will provide a field-oriented approach to assess how young steelhead trout respond to ambient water temperatures. The results of this information can then be used: (1) to identify cause-and-effect type restoration actions within the watershed; (2) to identify what types of habitat provide the best thermal conditions; (3) to determine whether there is a difference in thermal requirements between the anadromous steelhead and the resident rainbow trout; and, (4) as a basis for further field-oriented thermal bioenergetics research on this and other watersheds within the Bay-Delta.

b. Proposed Scope of Work

1. Location and/or Geographic Boundaries of the Project - The Corte Madera Creek watershed covers 28 miles located in the eastern part of central Marin County (Figure 1). It drains into San Francisco Bay just south of the San Quentin Peninsula, approximately 10 miles north of the Golden Gate. The watershed extends from latitude 37.85 °N to 38.03 °N and from 122.51 °W to 122.61 °W. Its elevations range from sea level to 2,571 feet at the East Peak of Mount Tamalpais.

2. Approach - To determine the relationship between water temperatures and growth and productivity of young steelhead trout in the creeks of the Corte Madera Creek Watershed, the following tasks will be undertaken: Task 1: Water Temperature Monitoring; Task 2: Fish Sampling; Task 3: Data Reduction and Data Entry; Task 4: Analysis and Report of Results; Task 5: Meetings; and, Task 6: Project Management. Some of the methodologies used in Tasks 1-4, including the use of volunteers to monitor the thermographs (see Appendix), and the special precautions taken (Rich, 1983, 1979) to minimize stress on the trout during capture, will be identical to that used in the 1999 studies (Rich, 2000a). Collecting food from trout stomachs and the bioenergetics modeling were not methodologies used in the 1999 studies. The QA/QC Plan used in the 1999 studies (Rich, 2000a) will be used for the proposed study.

Task 1: Water Temperature Monitoring - Similar to the 1999 studies (Rich, 2000a), thermograph sites will be selected in the following creeks: Corte Madera; San Anselmo; Cascade; Sleepy Hollow; and, Ross. The results of the 1999 studies demonstrated that water temperatures increased sooner in some areas than the onset of the thermal monitoring period (April through September). Hence, thermograph monitoring will extend from March through September. This time period will cover the parr-smolt transformation during the spring and spring and summer rearing of young steelhead trout. Thermographs ("tidbits", Onset Computer, Massachusetts) will be placed in representative areas of each creek. The number and location of each thermograph will be determined by Dr. Rich during March and again during subsequent visits to the creeks, as they dry up. It is anticipated that some of the thermograph sites will be the same as those selected in 1999. We will use the same procedure for the thermal installation and monitoring as was used in the 1999 study (Rich, 2000a)

Task 2: Fish/Fish Stomach Sampling - Based on the results of the 1999 habitat surveys (Rich, 2000a), fish sampling sites will be selected in Corte Madera, Ross, San Anselmo, Sleepy Hollow, and Ross creeks. The sites will be representative of the habitat types observed in each of the creeks during the 1999 surveys. Sampling will occur monthly, using electrofishing. After each pass, fish will be identified to species and enumerated. For each fish, the following items will be recorded: species name; fork length; and, weight. The stomach contents of the captured trout will be extracted by gastric lavage, using a small 12-volt bilge pump with a hose connected to a stainless steel turkey baster. This will provide a continuous flow of water to flush stomach contents onto a fine mesh screen (Hawkins and Tipping, 1999). The contents of the stomach will then be weighed and preserved (10% formalin) for identification of food organisms later. In addition, to determine the relationship between wet to dry weights of the food contents (needed in the bioenergetics analysis), the stomach contents from 10-20 (depending upon size ranges) trout per creek will be saved. These samples will be dried later in a drying oven. Scales will be obtained for age determination. After completing the recording of data and gastric lavage on the trout, the fishes will be returned carefully to the sampling station from which they were collected.

Task 3: Data Reduction and Data Entry -All data from the thermographs will be downloaded using Onset Computer's program, Boxcar. All data recorded on the data survey sheets will be entered into DBASE (Windows 98), a computer data management program.

Task 4: Analysis and Report of Results - The data from each thermograph will be used in the following three forms: (1) the original database, depicting the water temperatures in 10 minute intervals from April through September; (2) reduced form of the database, depicting daily minimum, mean, and maximum temperatures; and, (3) bioenergetic-based database which can be used to determine the relationship between water temperatures and growth and productivity of young steelhead. Data recorded (species name, pass number, length and weight) from the electrofishing will be transferred to the program, Microfish (Van Deventer and Platts, 1983), where population size estimates, mean lengths, mean weights, biomass, and standard deviations will be computed. Statistical analyses (analysis of variance) will be conducted, using the computer statistical program, SPSS.

Scales of the steelhead trout will be examined, both under a stereoscope (Leica MS5), with fiber optic light (Leica) and with the use of a microfiche reader/copier (Micron Microcopy 15A). Magnification will be between 10-40X, depending upon the size of the scale.

Bioenergetics modeling of fish growth is a useful approach for assessing the effects of water temperatures on steelhead trout. A bioenergetics approach is appealing because: (1) growth is an important indicator of population health; and, (2) bioenergetics modeling has an extensive record of previous applications in research and management (Hanson et al., 1997; Ney, 1993; Railsback and Rose, 1999; Beauchamp et al., 1989; Boisclair and Leggett, 1989; Boisclair and Sirois, 1993; Brandt, 1993; Hansen et al., 1993; Hartman and Brandt, 1995; Labar, 1993; Mason et al., 1995; Rand et al., 1994). Using data collected in the field (i.e., water temperatures, food eaten by young steelhead), and calculating steelhead growth over time, together with the computer bioenergetics model developed by Hewett and Johnson (1992) and revised by Hanson et al. (1997), it will be possible to determine the relationship between daily water temperatures and growth rate and relative productivity of juvenile steelhead in the Corte Madera Creek Watershed. Such an approach will provide a functional site-specific field-oriented determination of the relationship between growth/food conversion efficiency and water temperatures for juvenile steelhead in selected creeks within the Corte Madera Creek watershed. These results will then be used to determine if and where (i.e., which creeks and/or which reaches of creeks) water temperatures were limiting to young steelhead trout.

The work products will consist of Draft and Final Technical Reports describing the full effort, including: Introduction/Background; Scope of Work/Objectives; Methodology for all components (i.e., thermograph installation, fish sampling, data entry, data analysis); Results (i.e., water temperatures, fish population, food eaten, age determinations); Analysis and Discussion of Results; Conclusions; Recommendations for Restoration Actions; Literature Cited; and, Appendices.

Task 5: Meetings - Three meetings are planned. Before any data are collected, there will be an initial meeting with Dr. Rich and *Friends*. The purpose of the meeting will be two-fold (2) review the study plan, objectives, and tasks to be performed; and, (2) recruit volunteers to assist with the thermograph monitoring. The second meeting will occur after the Draft Report has been completed by Dr. Rich and the community has had a chance to review it. At that meeting, Dr. Rich will discuss the results of the studies and provide recommendations for future enhancement activities and studies, if

warranted. In addition, this meeting will provide an opportunity for *Friends* to ask questions and make recommendations. A final meeting will be with the Technical Advisory Committee and Dr. Rich (also a member of this committee) to discuss changes, additions, and deletions to the Final Report.

Task 6: Project Management - Project management will consist of submitting progress reports and invoicing, coordination with agencies and community groups, report review, production, and distribution.

3. Monitoring and Assessment Plans - This scope of work does not include plan implementation or the resultant monitoring, so details are not provided at this time.

4. Data Handling and Storage - Data will be captured and stored in various formats, including the data management program, DBASE, the thermograph program, Boxcar, Sigmaplot for thermograph and other figures, the bioenergetics program, Fish Bioenergetics 3.0 (for bioenergetics modeling), Microfish program (fish lengths, weights, and population data), photographs of thermograph and fish sampling sites, and photographs of fish scales from the microfiche reader. A complete set of raw data will be submitted to *Friends* by Dr. Rich at the end of the project. These data will augment the existing database on fishery resources conditions in the watershed collected by *AAR* in 1999.

5. Expected Products/Outcomes - In addition to CALFED quarterly reports, a Draft Report and Final Report will be submitted to *Friends*, agency biologists, and other interested parties.

6. Work Schedule - The proposed project Work Schedule assumes funding begins by February, 2001 and is as follows: Task 1: Water Temperature Monitoring (3/1-9/30/01); Task 2: Fish Sampling (4/1/01-9/30/01); Task 3: Data Reduction and Data Entry (4/1-11/30/01); Task 4: Analysis and Report of Results (11/01-05/31/02); Task 5: Meetings (2/01, 3/02); and, Task 6: Project Management (throughout project).

Feasibility - The feasibility of this proposed project is assured for a variety of reasons. First, the proposed project has the full support of the community. Second, the information can be collected without accessing private property. Third, Dr. Rich has the required federal (National Marine Fisheries Service) and state (California Department of Fish and Game) permits to sample steelhead trout in the ~~Corte~~ Corte Madera Creek Watershed. Finally, as the proposed project is located in the county where Dr. Rich lives, if any field or other problems arise on days when Dr. Rich is not in the field with her biologists, access by her to the project area is very easy (at most, one half hour).

III. Applicability to CALFED ERP Goals and Implementation Plan and CVPIA Priorities

a. ERP Goals and CVPIA Priorities

The proposed project addresses three of five CALFED Ecosystem Restoration Program (ERP) Strategic Goals and addresses one of the most important limiting factors identified in the CVPIA list of priorities (page 10 of Attachment G of the 2001 Proposal Solicitation Package): water temperature requirements and impacts on steelhead trout in the Bay-Delta system.

Specifically, the proposed project addresses ERP Goals 1, 2 and 4 as follows:

Goal 1 - At-Risk Species: - "Achieve recovery of at-risk native species.... in San Francisco Bay and the watershed above the estuary." By determining what temperatures are stressful and which are not, restorations actions can be implemented to reduce the thermal stress which, in turn, will improve conditions for the at-risk species, the steelhead.

Goal 2: Ecosystem Processes and Biotic Communities: - "Rehabilitate natural processes in the Bay-Delta system..." By determining what temperatures are stressful and which are not, restorations actions can be implemented to reduce the thermal stress which, in turn, will improve natural conditions in on of the watershed in the Bay-Delta system.

Goal 4 - Habitats: - "... becomes important to protect and restore large expanses of major habitat types..." By determining what temperatures are stressful and which are not, restorations actions can be implemented to reduce the thermal stress which, in turn, will improve habitat conditions for steelhead.

The proposed project also addresses water temperature requirements and impacts on steelhead trout, which is one of the most important limiting factors identified in the CVPIA list of priorities. The results of the proposed project will provide much-needed data on the responses of young steelhead trout to ambient water temperatures in a small watershed which flows into San Francisco Bay. Due to the fact that there are so few field-oriented site-specific water temperature studies on any salmonid for any of the creeks and rivers flowing into San Francisco Bay, the results of the proposed project could prove invaluable in helping to manage steelhead populations in other systems flowing into the Bay, if conditions are similar.

b. Relationship to other Ecosystem Restoration Projects

The proposed study is part of an ongoing effort by *Friends* to improve conditions in the Corte Madera Creek Watershed. The proposed study will address critical information needs, regarding the relationship between water temperatures and growth and productivity of steelhead trout in the Corte Madera Creek Watershed. From the results of the proposed study, it will be possible to identify restoration actions which will improve conditions for young steelhead and hence, for the watershed as a whole. In addition, it may be possible to transfer the thermal requirement information for young steelhead in this watershed to those in other Bay-Delta watersheds, if conditions are similar. It will serve as a general template for similar field-oriented thermal bioenergetics projects for other Bay-Delta systems.

In addition to developing site-specific relationships between water temperatures and juvenile steelhead thermal requirements, two secondary benefits will result from the proposed study: (1) continuation of the collection of water temperature data; and, (2) continuation of the collection of fish population data for the watershed. Considerable variability occurs from year to year in both water temperatures and fish population conditions in the watershed. These additional data will be of use in increasing our knowledge of thermal and fish diversity and population conditions in the watershed. Hence, the proposed project will build upon our knowledge on thermal requirements of young steelhead trout and augment the baseline information of water temperatures and fish diversity, population size and abundance.

c. Requests for Next-Phase Funding

Although *Friends* may submit requests for next-phase funding, that decision has not been made. The projects to be implemented to deal with the potential limiting factors identified in the proposed study are, as yet, undefined.

d. System-Wide Ecosystem Benefits

The proposed project will provide important field-based data on the thermal requirements of young steelhead trout in a Bay-Delta watershed. As there are few field thermal studies on steelhead trout, the information resulting from the proposed project can then be used: (1) to identify cause-and-effect type restoration actions within the watershed; (2) to identify what types of habitat provide the best thermal conditions; (3) to determine whether there is a difference in thermal requirements between the anadromous steelhead and the resident rainbow trout; and, (4) as a general template for further field-oriented thermal bioenergetics research on this and other watersheds within the Bay-Delta System. In addition, two secondary benefits will result from the proposed study: augmentation of the existing water temperature and fish population databases for the watershed.

IV. Qualifications

Ms. Goldman will serve as a volunteer project manager as part of her participation in *Friends*. She will supervise contract administration, write progress reports, and supervise preparation of invoices. She will also coordinate interaction with the Advisory Committee and its subcommittees, public meetings, and review of documents and technical reports. Her recent professional experience includes the following conservation planning efforts from 1991 to the present:

- Project Manager for Habitat Conservation Plan for California red-legged frog found at Bonny Doon Quarry, Santa Cruz County. This HCP required surveys and report preparation, negotiation with USFWS, mitigation plan development, employee education, and environmental compliance monitoring.
- Project Manager for California Aqueduct, San Joaquin Field Division Habitat Conservation Plan, coordinating data gathering and plan development for the Department of Water Resources. This project includes supporting documentation, such as the Operations and Maintenance Plan, for permits covering operations and maintenance activities along approximately 125 miles of aqueduct corridor in central California between Kettleman City and the Grapevine. It requires coordination and negotiation among federal and state permitting agencies, different divisions of the Department of Water Resources, adjacent landowners, and State Water Contractors.
- Project Manager for Coalinga Habitat Conservation Plan. This conservation planning effort is based on the Pleasant Valley Habitat Conservation Plan, which was abandoned because of opposition from the Fresno County Farm Bureau. The project required coordinating resource surveys, data gathering, and plan development for Fresno County and the City of Coalinga; ranchers; several oil companies, including Chevron; and three aggregate mining companies. Fresno County has dropped out of this effort and the HCP is being used as the basis for a planning policy document for the City of Coalinga, which will use it to ensure compliance with State and Federal Endangered Species Acts.
- Project Manager for biological analyses and preserve design for San Joaquin County Habitat Conservation and Open Space Plan, coordinating data gathering and preserve design for the San Joaquin County Council of Governments. This project included gathering and analyzing biological baseline data for all of San Joaquin County, calculating impacts to habitat, and developing criteria for the selection of preserves and open space to compensate for impacts to the target species. There are approximately 100 sensitive species on the species list.

During the period 1989 through 1991, Ms. Goldman worked on the following projects that called for management of biological, cultural, and paleontological resource surveys, mitigation planning and monitoring, and extensive coordination with state and federal agencies:

- Project Manager for joint NEPA/CEQA environmental review for a 73-mile railroad renovation in Kern and Inyo Counties.
- Project Manager for permitting two pipeline projects in the San Joaquin Valley for Mobil Oil Corporation.
- Project Manager for the Pacific Gas and Electric proposed natural gas pipeline reinforcement project in San Bernardino and Kern Counties.
- Project Manager for the Southern California Gas proposed natural gas pipeline project in San Bernardino County.

- Assistant Project Manager for the Wyoming-California Pipeline Company proposed pipeline project in Wyoming, Utah, Nevada, and southeastern California.

References for Ms. Guldman:

Mr. Peter Cross
U.S. Fish and Wildlife Service
3310 El Camino Avenue Suite 130
Sacramento CA 95821-6340
Voice: (916) 979-2725
Fax: (916) 979-2723
Email: peter_cross@smtp2.irm.r9.fws.gov

Ms. Dale K. Hoffman-Floerke
California Department of Water Resources
3251 S Street
Sacramento CA 95816
Voice: (916) 227-7530
Fax: (916) 227-7554
Email: dalehf@water.ca.gov

Ms. Gail Presley
California Department of Fish and Game
1416 Ninth Street Room 1341
Sacramento CA 95814
Voice: (916) 653-9384
Fax: (916) 653-2588
Email: GPRESLEY@hq.dfg.ca.gov

Dr. Alice A. Rich designed, supervised, and wrote the Steelhead Restoration Plan for Corte Madera Creek Watershed, based on her 1999 studies. Dr. Rich has over 25 years of technical experience in a wide range of fisheries-related projects. Her professional experience encompasses work as a fisheries consultant, fisheries biologist, fish physiologist, analytical chemist, and university lecturer. She is a recognized expert in thermal fish physiology, as well as other fishery resources needs, and has been called upon as an expert witness on the impacts of water temperature, water quality, water diversions, migration barriers, timber harvest practices, and catch-and-release fishing on fishery resources. She has designed and supervised numerous steelhead trout and salmon thermal physiology studies in California, Idaho, Nevada, Washington, and Maine and has provided expert witness testimony for the California Department of Fish and Game and Sacramento County on the thermal impacts of altered stream flows on steelhead trout and other salmonids in the Yuba River, American River, Sacramento and San Joaquin Rivers. The results of Dr. Rich's thermal bioenergetics studies which identified thermal requirements for juvenile chinook salmon in the American River are currently used by both state and federal agencies in the Central Valley.

References for Dr. Rich

Mr. Ed Stewart
City and County of San Francisco
San Francisco Water Department
1000 El Camino Real
P.O. Box 370
Millbrae, CA 94030
Voice: (650) 872-5933

Mr. James R. Bybe
National Marine Fisheries Service
777 Sonoma Ave., Room 325
Santa Rosa, CA 95404
Voice: (707) 575-6052

Mr. Michael Rugg
Department of Fish and Game
7329 Silverado Trail
Napa, CA 94558
Voice: (707) 944-5523

V. cost

The total budget costs requested from CALFED for this proposal is \$94,400 (Table 1). This cost represents two thirds of the total cost (\$141,400) of the project, including in-kind services (\$47,000) from volunteer from *Friends*.

Table 1. Total Budget for Proposed Project

Task	Service Contract	Direct Costs (Friends) printing and postage	In-Kind Services	Total Cost	Total Amount Requested
Task 1: Water Temperature Monitoring:	\$ 5,000		\$25,000	\$30,000	\$5,000
Task 2: Fish Sampling	\$50,000			\$50,000	\$50,000
Task 3: Data Reduction/entry	\$ 5,000			\$5,000	\$ 5,000
Task 4 Analysis & Report	\$25,000			\$25,000	\$25,000
Task 5: Meetings	\$ 3,000			\$3,000	\$ 3,000
Task 6: Project Management	\$ 2,000			\$ 2,000	\$ 2,000
6a: Progress Reports and Invoicing		\$ 200	\$ 3,000	\$3,200	\$ 200
6b: Coordination with Agencies and Community Groups		\$1,000	\$ 6,000	\$7,000	\$ 1,000
6c: Report Review, Production, Distribution		\$3,200	\$ 13,000	\$ 16,200	\$3,200
Total	\$90,000	\$4,400	\$47,000	\$141,400	\$94,400

VI. Local Involvement

For this project, volunteers will be used to monitor the thermographs.

A broader public involvement program is carried out by *Friends* in several ways, using the working relationships *Friends* has established with the following entities in the watershed: Marin County Flood Control and Water Conservation District, Marin County Department of Public Works, Marin County Open Space District, Marin County Stormwater Pollution Prevention Program, Marin Municipal Water District, Town of San Anselmo, Town of Ross, Town of Fairfax, and City of Larkspur.

One major form of public involvement is the watershed planning Advisory Committee. The groups mentioned above, along with the Regional Water Quality Control Board and California Department of Fish and Game, serve on the Advisory Committee that sets overall goals and objectives for the watershed plan policy. The committee also reviews and evaluates technical information, and provides guidance during development of components of the watershed plan. The Advisory Committee also includes representatives from a broad range of stakeholders, as well as people with expertise in major concerns in the watershed, including water quality, fishery resources, native plants and wildlife, wetland and upland habitats, flood control, and recreational uses. Representatives from local governments, regulatory agencies, environmental organizations, recreational interests, and private landowners are included. Dr. Rich is on the Technical Subcommittee, which includes people with expertise in fisheries biology, hydrology, plants, wildlife.

Friends also publishes a twice-yearly newsletter (circulation 5000 copies) with information about watershed planning activities, habitat enhancement projects, studies being undertaken using grants obtained by *Friends*, and other projects and activities undertaken by *Friends*. Those activities include evening talks, walks led by experts in natural and historical resources in the watershed, and school water quality monitoring programs conducted in cooperation with *Friends*.

VII. Compliance with Standard Terms and Conditions

The applicant has reviewed the State and Federal standard terms contained in Attachments D (State) and E (Federal) and will comply with all terms.

VIII. Literature Cited

- Adams, B. L., W. S. Zaugg and L. R. McLain. 1973. Temperature effect on parr-smolt transformation in steelhead trout (*Salmo gairdneri*) as measured by gill sodium-potassium stimulated adenosine triphosphatase. *Comp. Biochem. Physiol.* 44 A 1333-1339.
- Alabaster, J. S. and R. Lloyd. 1980. Water quality criteria for freshwater fish. Butterworths, London. 297 pp.
- Beauchamp, D. A., D. J. Stewart, and G. L. Thomas. 1989. Corroboration of a bioenergetics model for sockeye salmon. *Trans. Amer. Fish. Soc.* 118: 597-607.
- Boisclair, D. and W. C. Leggett. 1989. The importance of activity in bioenergetics models applied to actively foraging fishes. *Can. J. Fish. Aquat. Sci.* 46: 1859-1867.
- Boisclair, D. and P. Sirois. 1993. Testing assumptions of fish bioenergetics models by direct estimation of growth, consumption, and activity rates. *Trans. Amer. Fish. Soc.* 122: 784-796.
- Brandt, S. B. 1993. The effect of thermal fronts on fish growth - a bioenergetics evaluation of food and temperature. *Estuaries* 16: 142-159.
- Brett, J. R. and T. D. D. Groves. 1979. Chapter 6: Physiological energetics. *In Fish Physiology, Vol. VIII, Bioenergetics and Growth.* 279-352.
- Cech, J. J. and C. A. Myrick. 1999. Steelhead and Chinook salmon bioenergetics: temperature, ration, and genetic effects. Univ. of Calif. Water Resources Center, Davis, California. UCAL-WRC-W-885. 72 pp.
- Cherry, D. S., K. L. Dickson, J. Cairns Jr. and J. R. Stauffer. 1977. Preferred, avoided, and lethal temperatures selected and avoided by fish at various acclimation temperatures. *J. Fish. Res. Board Can.* 32: 485-491.
- Cherry, D. S., K. L. Dickenson and J. Cairns, Jr. 1975. Temperatures of fish during rising temperature conditions. *J. Fish. Res. Board Can.* 34: 239-246.
- CMARP (Comprehensive Monitoring Assessment and Research Program Steering Committee). 1994. A proposal for the development of a comprehensive monitoring assessment and research program. Developed for CALFED. Final Report, April 24, 1998. 55 pp.
- Combs, B. D. and R. E. Burrows. 1957. Threshold temperatures for the normal development of chinook salmon eggs. *Prog. Fish. Cult.* 19(1): 3-6.
- Coutant, C. C. 1977. Compilation of temperature preference data. *J. Fish. Res. Bd. Can.* 34: 739-745.
- Craigie, D. E. 1963. An effect of water hardness in the thermal resistance of the rainbow trout, *Salmo gairdneri* Richardson. *Can. J. Zool.* 41: 825-830.

- Currie, R. J., W. A. Bennett and T. L. Beiting. 1998. Critical thermal minima and maxima of three freshwater game-fish species acclimated to constant temperatures. *Env. Bio. of Fish.* 51: 187-200.
- Dockray, J. J., I. J. Morgan, S. D. Reid and C. M. Wood. 1998. Responses of juvenile rainbow trout, under food limitation, to chronic low pH and elevated summer temperatures, alone and in combination. *J. of Fish Biol.* 52: 62-82.
- Elliott, J. M. 1981. Some aspects of thermal stress on freshwater teleosts. *In Stress and Fish.* (ed A. D. Pickering). Academic Press. Pages 209-245.
- Federal Register. 1998. Endangered and threatened wildlife and plants: listing of several evolutionarily significant units of west coast steelhead. *Federal Register*: 63: 32996-32998.
- Federal Register. 1997. Endangered and threatened species: listing of several evolutionarily significant units of west coast steelhead. *Federal Register*: 63: 43937-43954.
- Garside, E. T. and J. S. Tait. 1958. Preferred temperature of rainbow trout (*Salmo gairdneri* Richardson) and its unusual relationship to acclimation temperature. *Can. J. Zool.* 36: 563-567.
- Hansen, M. J., D. Boisclair, S. B. Brandt. And S. W. Hewett. 1993. Applications of bioenergetics models to fish ecology and management-where do we go from here. *Trans. Amer. Fish. Soc.* 122: 1019-1030.
- Hanson, P. , T. Johnson, J. Kitchell and D. E. Schindler. 1997. Fish bioenergetics 3.0. University of Wisconsin Sea Grant Institute, Report WISCU-T-97-001, Madison, Wisconsin.
- Hartman, K. J. and S. B. Brandt. 1995. Comparative energetics and development of bioenergetics models for sympatric estuarine piscivores. *Can. J. Fish. Aquat. Sci.* 52: 1647-1666.
- Hawkins, S. W. and J. M. Tipping. 1999. Predation by juvenile hatchery salmonids on wild fall chinook salmon *fry* in the Lewis River, Washington. *Calif. Fish and Game* 85(3): 124-129. 1999.
- Hewitt, S. W. and B. L. Johnson. 1992. Fish bioenergetics model 2. University of Wisconsin Sea Grant Institute, Report WIS-SG-92-250, Madison, Wisconsin.
- Hokansen, K. E. F., C. F. Kleiner and T. W. Thorslund. 1977. Effects of constant temperatures and diel temperature fluctuations in specific growth and mortality rates and yield of juvenile rainbow trout, *Salmo gairdneri*. *J. Fish. Res. Board Can.* 34: 639-648.
- Kaya, C. M. 1978. Thermal resistance of rainbow trout from a permanently heated stream and of two hatchery strains. *Prog. Fish-Cult.* 40: 138-142.
- Labar, G. W. 1993. Use of bioenergetics models to predict the effect of increased trout predation on rainbow smelt following sea lamprey control. *Trans. Amer. Fish Soc.* 122: 942-950.

- Lee, R. M. and J. N. Rinne. 1980. Critical thermal maximum of five trout species in the southwestern United States. *Trans. Amer. Fish. Soc.* 109:632-635.
- Mason, D. M., A. Goyke, and S. B. Brandt. 1995. A spacially bioenergetics measure of habitat quality for adult salmonines-comparisonsbetween Lakes Michigan and Ontario. *Can. J. Fish. Aquat. Sci.* 52: 1572-1583.
- Matthews, K. R., and N. H. Berg. 1997. Rainbow trout responses to water temperature and dissolved oxygen stress in two southern California stream pools. *J. of Fish Biol.* 50: 50-67.
- McEwan, D. and T. A. Jackson. 1996. Steelhead Restoration and Management Plan for California. California Department of Fish and Game, Sacramento, California.
- Ney, N. N. 1993. Bioenergetics modeling today - growing pains on the cutting edge. *Trans. Amer. Fish Soc.* 122:736-748.
- Peterson, R. H., A. M. Sutterlin and J. L. Metcalfe. 1979. Temperature preference of several species of *Salmo* and *Salvelinus* and some of their hybrids. *J. Fish. Res. Board Can.* 36: 1137-1140.
- Railsback, S. and K. A. Rose. 1999. Bioenergetics modeling of stream trout growth temperature and food consumption effects. *Trans. Amer. Fish. Soc.* 128:241-256.
- Rand, P. S., B. F. Lantry, R. Ogorman, R. w. Owens, and D. J. Stewart. 1994. Energy density and size of pelagic prey fishes in Lake Ontario, 1978-1990- implications for salmonine energetics. *Trans. Amer. Fish. Soc.* 123:519-534.
- Rich, A. A. 2000a. Fishery resources conditions of the ~~Corte~~ Corte Madera Creek Watershed, Marin County, California. Draft Copy. Prep. for Friends of Corte Madera Creek, Larkspur, California, March 15, 2000. 94 pp + appendices.
- Rich, A. A. 2000b. Testimony of Alice A. Rich Ph.D. Submitted to the State Water Resources Control Board by California Department of Fish and Game in the Matter of the Hearing *to Consider Adoption of a Water Rights Decision for the Lower Yuba River.* 15 pp.
- Rich, A. A. 1997. Testimony of Alice A. Rich, Ph.D. Submitted to the State Water Resources Control Board by California Department of Fish and Game in the Matter of the Hearing Regarding the Water Right Applications for the Delta Wetlands project proposed by Delta Wetlands Properties for Water Storage on Webb Tract, Bacon Island, Bouldin Island, and Holland Tract in Contra Costa and San Joaquin Counties. 60 pp.
- Rich, A. A. 1987a. Water temperatures which optimize growth and survival of the anadromous fishery resources of the lower American River. Prep. for Sacramento County, Sacramento. April, 1987. 24 pp.

- Rich, A. A. 1987b. Testimony of Alice A. Rich, Ph.D. Submitted to the State Water Resources Control Board by Sacramento County in the Matter of EBMUD versus Sacramento County et al. ...
- Rich, A.A. 1983. Smolting: circulating catecholamine and thyroxine levels in coho salmon (*Oncorhynchus kisutch*). Ph.D. Dissertation, University of Washington, Seattle, Washington, 97 pp.
- Rich, A. A. 1979. The use of stress to quantitate the survival potential of three strains of trout. M.S. Thesis, University of Washington, Seattle, Washington. 65 pp.
- Spigarelli, S. A. and M. M. Thommes. 1979. Temperature selection and estimated thermal acclimation by rainbow trout (*Salmo gairdneri*) in a thermal plume. J. Fish. Res. Board Can. 36: 366-376.
- Strange, R. J., R. B. Petrie and J. J. Cech, Jr. 1993. Slight stress does not lower critical thermal maximums in hatchery-reared rainbow trout. Folia Zool. 42: 251-256.
- Threader, R. W. and A. H. Houston. 1983. Heat tolerance and resistance in juvenile rainbow trout acclimated to diurnally cycling temperatures. Comp. Biochem. Physiol. 75A: 153-155.
- Van Deventer, J. S. and W. S. Platt. 1983. User's guide for MICROFISH 3.0. A software package for processing electrofishing data obtained by the removal method. U.S.F.S. Forestry Sciences Lab., Boise, Idaho.
- Wurtsbaugh, W. A. 1977. Effects of temperature, ration, and size on the growth of juvenile steelhead trout, *Salmo gairdneri*. M. S. Thesis, Oregon State University, Corvallis, Oregon. 69 pp.
- Wurtsbaugh, W. A. and G. E. Davis. 1977. Effects of temperature and ration level on the growth and food conversion efficiency of *Salmo gairdneri*, Richardson. J. Fish Biol. 11: 87-98.
- Zaugg, W. S. and H. H. Wagner. 1973. ATPase activity related to parr-smolt transformation and migration in steelhead trout (*Salmo gairdneri*): influence of photoperiod and temperature. Comp. Biochem. Physiol. 45B: 955-965.
- Zaugg, W. S., B. L. Adams and L. R. McLain. 1972. Steelhead migration: potential temperature effects as indicated by gill adenosine triphosphatase activities. Science 176: 415-416.

APPENDIX

A.A. RICH AND ASSOCIATES

Alice A. Rich, Ph.D.
Principal

150 Woodside Drive
San Anselmo, CA 94960
Tel: (415) 485-2937
Fax: (415) 485-9221
Email: aarfish@nbn.com

June 5, 1999

To: Thermograph Monitoring Volunteers

From: Alice A. Rich, Ph.D.

Re: Instructions

- Objectives:
- (1) Monitor status of thermographs weekly
 - (2) Determine whether or not thermographs need to be moved (i.e., thermographs are about to be or are no longer immersed in the creek)

Instructions

I am providing each of you with film (ASA 200 seems to work best in the afternoon; ASA 400 in the early morning for some of the darker sites), a camera for any who need one, the waterproof data sheets, clip board and pencils (do not use ink on data sheets-ink does not work), a AAA map of the area with the thermograph sites marked on it, and these Instructions. Each week, I need each of you to check your assigned thermographs. You will determine whether or not the thermograph exists (!), the light is on, and the thermograph is still immersed in water. The first entry line on your data sheet will be on the day I meet with you to show you what to do. In approximately one week, you will repeat this process and continue, weekly, until October 31. Although, it is not imperative that the weekly monitoring be exactly 7 days apart, please do not let it slide more than one day on either side. One of the main reasons for this is that I want to know as soon as possible, if any of the thermographs have been taken, so that I can replace it.

As I realize that it is almost summer and often people leave for vacations, it is important that you contact me ahead of time (phone: 485-2937) if you plan to be gone or cannot do your monitoring, so that I can either line up another volunteer or have one of my assistants take over the monitoring of your creek reach. I also realize that this is not the most exciting thing you have ever done or will ever do! Hence, if you really do not want to continue with the thermograph monitoring, please let me know immediately and one of my assistants will take over your creek reach.

A.A. RICH AND ASSOCIATES

Alice A. Rich, Ph.D.
Principal

150 Woodside Drive
San Anselmo, CA 94960
Tel: (415) 485-2937
Fax: (415) 485-9221
Email: aarish@nna.com

Thermograph Monitoring-Instructions for Volunteers
June 5, 1999
Page 3

If you Meet Any Curious Person

Upon reflection, I really ***do not*** want people to know where the thermographs are because the thermographs will probably disappear. And, **as** I have invested about \$3,000 in equipment out there, this would be a rather expensive thing to happen. So, if there are a lot of kids or even one (!), either wait for her/him to leave, or go to another site and return later. If someone comes up to you when you are doing your monitoring and wants to know what you are doing, go ahead and tell them, and caution them about the importance of leaving these things where they are and not letting anyone else know where they are. Also, please give them my business card (**a** stack of them are included in your clipboard inside) and ask them to call me. And, get their name and phone number and address (I will call them, introduce myself, and explain what we are doing). Finally, if you do have a conversation with someone while you are doing your monitoring, please write it down on the data sheet and call me. I will then decide whether or not we want to move the site.

Call Me if you have Questions!

If you have ***anything*** you want to talk with me about, regarding the creek, the instructions, or your assignment, or need more data sheets, please do not hesitate to call me at **485-2937**. If you need more film (I am using **35** mm print film, or, if you have a digital camera, I will provide you with the diskettes), either call me or buy the film and I will reimburse you.

Thank you all very much for your help!

cc: Sandy Goldman
Carol d'Alessio

Corte Madera Creek Thermograph Monitoring

Weekly Monitoring Log

THERMOGRAPH NO. _____ LATITUDE _____ LONGITUDE _____

Observation NO	Additional Comments

A.A. RICH AND ASSOCIATES

Alec A. Rich, Ph.D.
Principal
150 Woodside Drive
San Anselmo, CA 94960
Tel: (415) 485-2937
Fax: (415) 485-9221
Email: aarich@rich.com

Environmental Compliance Checklist

All applicants must fill out this Environmental Compliance Checklist. Applications must contain answers to the following questions to be responsive and to be considered for funding. Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.

1. Do any of the actions included in the proposal require compliance with either the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), or both?

YES

NO

2. If you answered yes to # 1, identify the lead governmental agency for CEWNEPA compliance.

Lead Agency

3. If you answered no to # 1, explain why CEQA/ NEPA compliance is not required for the actions in the proposal. The proposed actions are studies of steelhead trout. No physical change to the environment will occur as a result of this project. It is categorically exempt from the provisions of CEQA under Section 15306 of the CEQA Guidelines. On similar grounds, it is categorically excluded from the provisions of NEPA.

4. If CEQA/NEPA compliance is required, describe how the project will comply with either or both of these laws. Describe where the project is in the compliance process and the expected date of completion.

5. Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?

YES

NO

6. Please indicate what permits or other approvals may be required for the activities contained in your proposal. Check all boxes that apply.

LOCAL

- Conditional use permit
- Variance
- Subdivision Map Act approval
- Grading permit
- General plan amendment
- Specific plan approval
- Rezone
- Williamson Act Contract cancellation
- Other _____
(please specify)
- None required

STATE

- CESA Compliance (CDFG)
- Streambed alteration permit (CDFG)
- CWA § 401 certification (RWQCB)
- Coastal development permit (Coastal Commission/BCDC)
- Reclamation Board approval
- Notification (DPC, BCDC)
- Other Dr. Rich has a Calif. Dept. Fish and Game Collectors Permit which expires 10/31/02
(please specify)
- None required

FEDERAL

- ESA Consultation (USFWS)
- Rivers & Harbors Act permit (ACOE)
- CWA § 404 permit (ACOE)
- Other Dr. Rich has a permit from the National Marine Fisheries Service which expires June 30, 2003
(please specify)
- None required

DPC = Delta Protection Commission
 CWA = Clean Water Act
 CESA = California Endangered Species Act
 USFWS = U.S. Fish and Wildlife Service
 ACOE = U.S. Army Corps of Engineers

ESA = Endangered Species Act
 CDFG = California Department of Fish and Game
 RWQCB = Regional Water Quality Control Board
 BCDC = Bay Conservation and Development Comm.

9. Will the applicant acquire any interest in land under the proposal (fee title or a conservation easement)?

YES

 X
NO

10. What entity/organization will hold **the** interest? _____

11. If **YES** to # 10, answer the following:

Total number of acres to be acquired under proposal _____

Number **of** acres to be acquired in fee _____

Number of acres to be subject to conservation easement _____

12. For all proposals involving physical changes to the land or restriction in land **use**, describe what entity or organization will:

Manage the property _____

Provide operations and maintenance services _____

Conduct monitoring _____

13. For land acquisitions (fee title or easements), will existing water rights also be acquired?

YES

NO

14. Does the applicant propose any modifications to the water right or change in the delivery of the water?

YES

 X
NO

15. If **YES** to # 14, describe _____

**APPLICATION FOR
FEDERAL ASSISTANCE**

OMB APPROVED FOR REPRODUCTION

1. TYPE OF SUBMISSION Application <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction		2. DATE SUBMITTED 5/15/00	Applicant Identifier N/A
Preapplication <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction		3. DATE RECEIVED BY STATE N/A	State Application Identifier N/A
		4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

5. APPLICANT INFORMATION

Legal Name: Friends of Corte Madera Creek Watershed

Organizational Unit:

Address (give city, county, State, and zip code):
P.O. Box 411
Larkspur, CA 94977

Name and telephone number of person to be contacted on matters involving this application (give area code):
Sandra Goldman
(415) 456-5052

6. EMPLOYER IDENTIFICATION NUMBER (EIN):
618-0365270

7. TYPE OF APPLICANT: (enter appropriate letter in box) M

A. State	H. Independent School Dist.
B. County	I. state Controlled Institution of Higher Learning
C. Municipal	J. Private University
D. Township	K. Indian Tribe
E. Interstate	L. Individual
F. Intermunicipal	M. Profit Organization
G. Special District	N. Other (Specify) <u>Non-profit</u>

8. TYPE OF APPLICATION

New Continuation Revision

If Revision, enter appropriate letter(s) in box(es):

A. Increase Award B. Decrease Award C. increase Duration
O. Decrease Duration Other (specify):

9. NAME OF FEDERAL AGENCY:

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER
XX-XX

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Ecosystem Restoration-The Relationship Between Water Temperature and Steelhead Trout Growth and Productivity in the Corte Madera Creek Watershed, Marin County, California

12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.):
Marin County

13. PROPOSED PROJECT

Start Date <u>2/1/01</u>	Ending Date <u>5/02</u>	14. CONGRESSIONAL DISTRICTS OF:
		a. Applicant <u>6th</u> District
		b. Project <u>6th</u> District

15. ESTIMATED FUNDING

a. Federal	\$	<u>94,400</u>	⁰⁰
b. Applicant	\$	<u>47,000</u>	⁰⁰
c. State	\$		⁰⁰
d. Local	\$		⁰⁰
e. Other	\$		⁰⁰
f. Program Income	\$		⁰⁰
g. TOTAL	\$	<u>141,400</u>	⁰⁰

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON DATE _____

b. No. PROGRAM IS NOT COVERED BY E. O. 12372
 OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
 Yes "Yes." attach an explanation. No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Type Name of Authorized Representative: Sandra Goldman b. Title: Co-Chairperson c. Telephone Number: (415) 456-5052

d. Signature of Authorized Representative: Sandra Goldman e. Date Signed: 5/15/00

ASSURANCES • NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 19 (REV. 3-95) F&C

A. A. Rich and Associates

COMPANY NAME

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

Sandra Goldman

OFFICIAL'S NAME

5/15/00

DATE EXECUTED

EXECUTED IN THE COUNTY OF

Andre Rich, MD *Marin*

PROSPECTIVE CONTRACTOR'S SIGNATURE

owner, A. A. Rich and Associates

PROSPECTIVE CONTRACTOR'S TITLE

A. A. Rich and Associates

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Costo Decisions Corp

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and
Other Responsibility Matters, Drug-Free Workplace
Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - **The** prospective primary participant further agrees by submitting this proposal that it will include the clause titled: "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction." provided by the department **or agency** entering into this covered transaction, without modification. **in** all lower tier covered transactions **and** in **a** solicitations for lower **tier** covered transactions. See below for language to be used: use this form for certification and sign: **or** use Department of the Interior Form **1954 (DI-1954)**. (See Appendix A of Subpart D of **43 CFR Part 12.**)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of **43 CFR Part 12.**)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of **43 CFR Part 12.**)

Signature on this form provides for compliance with certification requirements under **43 CFR Parts 12 and 18**. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement **or** loan.

PART A Certification Regarding Debarment, Suspension, and Other Responsibility **Matters** -
Primary Covered Transactions

CHECK IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, **or** voluntarily excluded from covered transactions by any Federal department **or** agency:
 - (b) Have **not** within a three-year period preceding this proposal been convicted of **or** had a civil judgment rendered against them for commission of fraud **or** a criminal offense in connection with obtaining, attempting to obtain, **or** performing a public (Federal, State **or** local) **transaction or** contract under a public transaction: violation of Federal **or** State antitrust statutes **or** commission of embezzlement, theft, forgery, bribery, falsification **or** destruction of records, making false statements. **or** receiving **stolen** property:
 - (c) Are not presently indicted for **or** otherwise criminally **or** civilly charged by a governmental entity (Federal, State **or** local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; **and**
 - (d) Have not within a three-year period preceding this application/proposal had one **or** more public transactions (Federal, State **or** local) terminated for cause **or** default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.
-

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -
Lower Tier Covered Transactions

CHECK IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, **or** voluntarily excluded from participation in this transaction by any Federal department **or** agency.
- (2) Where the prospective lower tier Participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

DI-2010
March 1995
(This form consolidates DI-1953, DI-1954,
DI-1955, DI-1956 and DI-1963)